# DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY
REFER TO: Joint Interoperability Test Command (JTE)                    **25 Mar 09**

MEMORANDUM FOR DISTRIBUTION

SUBJECT:  Special Interoperability Test Certification of the Polycom HDX 9000 Series, HDX 8000 Series, HDX 7000 Series, and HDX 4000 Series with Software Release 2.0.5_J

References:  (a)  DoD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b)  CJCSI 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c)  through (e), see Enclosure 1

1.  References (a) and (b) establish the Defense Information Systems Agency, Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2.  The Polycom HDX 9000 Series, HDX 8000 Series, HDX 7000 Series, and HDX 4000 Series with Software Release 2.0.5_J  are hereinafter referred to as the System Under Test (SUT).  The SUT met all the critical interface and functional interoperability requirements of the Unified Capabilities Requirements, appendix 8, and is certified for joint use within the Defense Switched Network (DSN) as a Video Teleconferencing (VTC) system.  The Polycom HDX 9004, 8000HD, 7000, and 4000HD were the only VTC systems tested within the HDX family.  The HDX 9001, 9002, 8002, 8004, 7001, 7002, 4001 and 4002 VTC systems employ the exact same software and video codec within their respective HDX series.  These other systems within the respective HDX series were determined by JITC analysis to be functionally identical to the SUT for interoperability certification purposes.  The SUT meets the critical interoperability requirements for serial interfaces; however, the serial interfaces must connect to an Integrated Access Switch (IAS) or Terminal Adapter (TA), which provides an inverse multiplex capability and a direct interface to the DSN.  The SUT is certified with any IAS or TA on the Unified Capabilities (UC) Approved Products List.  The SUT also met the requirements for the International Telecommunication Union – Telecommunication Standardization Sector (ITU-T) H.323 interface standard; however, Assured Service is not yet defined for the ITU-T H.323 interface.  Since ITU-T H.323 interfaces do not provide Assured Services during a crisis or contingency, users' access to the DSN via an ITU-T H.323 interface will be on a best effort basis.  Therefore, Command and Control (C2) VTC users and Special C2 VTC users are not authorized to be served by an ITU-T H.323 interface.  The SUT meets the critical interoperability requirements set forth in reference (c) using test procedures derived from reference (d).  No other configurations, features, or functions, except those cited within this

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report, are certified by the JITC or authorized by the Program Management Office for use within the DSN. This certification expires upon changes that affect interoperability, but no later than four years from the date of this memorandum.

3. This finding is based on interoperability testing conducted by JITC, review of the vendor's Letters of Compliance (LoC), and the Defense Information System Network (DISN) Security Accreditation Working Group (DSAWG) accreditation. Interoperability testing was conducted by JITC at the Global Information Grid Network Test Facility, Fort Huachuca, Arizona, from 1 through 19 December 2008. Review of the LoC was completed on 1 March 2009. DSAWG grants accreditation based on the security testing completed by DISA-led Information Assurance test teams and published in a separate report (reference (e)). DSAWG accreditation was granted on 10 March 2009. The Certification Testing Summary (Enclosure 2) documents the test results and describes the test configuration.

4. The Functional Requirements used to evaluate the interoperability of the SUT and the interoperability statuses are indicated in Table 1.

**Table 1. SUT Functional Requirements and Interoperability Status**

| Interface | Critical | Certified | Requirements<br>Required or Conditional | Status | UCR Reference |
|---|---|---|---|---|---|
| ITU-T H.323 | No[1] | Yes[2] | The VTC system/endpoints shall meet the requirements of FTR1080B-2002 (R) | Met | A8.5 |
| | | | ITU-T H.323 in accordance with FTR 1080B-2002 (C) | Met | A8.5 |
| | | | Layer 3 Differential Service Code Point tagging as specified in UCR paragraph A.3.2.9.2 (C) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics shall not degrade or impair switch and associated network operations (R) | Met | A8.5 |
| ISDN BRI | No[1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Integrated BRI interface shall be in conformance with Terminal Adaptor requirements in UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations. (R) | Met | A8.5 |

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**Table 1.  SUT Functional Requirements and Interoperability Status (continued)**

| Interface | Critical | Certified | Requirements Required or Conditional | Status | UCR Reference |
|---|---|---|---|---|---|
| ISDN PRI T1 ISDN PRI E1 | No [1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Integrated PRI interface shall be in conformance with IAS requirements in UCR, Appendix 6 (IAS) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations.(R) | Met | A8.5 |
| Serial Interfaces[3]: EIA-366A EIA-449 EIA-530 ITU-T V.35[4] | No [1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Connections shall be in conformance with the requirements for serial interface(s) as described in FTR 1080B-2002 (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations.(R) | Met | A8.5 |
| | Yes | Certified | Security (R) | See note 5. | A8.7 |

**NOTES:**
1    The VTC system interface requirements can be met with an ISDN BRI, ISDN PRI, Serial, or ITU-T H.323 interface.
2    The SUT met the requirements for the ITU-T H.323 interface standard; however, Assured Service is not yet defined for the ITU-T H.323 interface.  Since ITU-T H.323 interfaces do not provide Assured Services during a crisis or contingency, users' access to the DSN will be on a best effort basis.  Therefore, C2 VTC users and Special C2 VTC users are not authorized to be served by an ITU-T H.323 interface.
3    The SUT meets the critical interoperability requirements for serial interfaces; however, the serial interfaces must connect to an IAS or TA which provides an inverse multiplex capability and a direct interface to the DSN.  The SUT is certified with any IAS or TA on the DSN Approved Products List.
4    The electrical physical interface tested was ITU-T V.35 in accordance with ITU-T V.36/V.37.
5    Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (e).

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**Table 1.  SUT Functional Requirements and Interoperability Status (continued)**

| LEGEND: | | | |
|---|---|---|---|
| A | UCR Appendix | ISDN | Integrated Services Digital Network |
| BRI | Basic Rate Interface | ITU-T | International Telecommunication Union - Telecommunication |
| C | Conditional | | Standardization Sector |
| C2 | Command and Control | JITC | Joint Interoperability Test Command |
| CPE | Customer Premises Equipment | kbps | kilobits per second |
| DISA | Defense Information Systems Agency | kHz | kiloHertz |
| DSN | Defense Switched Network | Mbps | Megabits per seconds |
| E1 | European Basic Multiplex Rate (2.048 Mbps) | PMO | Program Management Office |
| EIA | Electronic Industries Alliance | PRI | Primary Rate Interface |
| EIA-366A | Standard for interface between data terminal equipment and automatic calling equipment for data communication | R | Required |
| | | SUT | System Under Test |
| | | T1 | Digital Transmission Link Level 1 (1.544 Mbps) |
| EIA-449 | Standard for 37-position and 9-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange | TA | Terminal Adapter |
| | | UCR | Unified Capabilities Requirements |
| | | V.35 | Standard for data transmission at 48 kbps using 60-108 kHz group band circuits |
| EIA-530 | Standard for 25-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange | V.36 | Modems for synchronous data transmission using 60-108 kHz group band circuits |
| FTR | Federal Telecommunications Recommendation | V.37 | Synchronous data transmission at a data signaling rate higher than 72 kbps using 60-108 kHz group band circuits |
| H.323 | Standard for multi-media communications on packet-based networks | VTC | Video Teleconferencing |
| IAS | Integrated Access Switch | VTU | Video Teleconferencing Unit |

5.  No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) System, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail.  More comprehensive interoperability status information is available via the JITC System Tracking Program (STP).  The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil.  Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet), or http://199.208.204.125 (SIPRNet).  Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi.

6.  The JITC point of contact is Mr. Brad Friedman, DSN 879-5057, commercial (520) 538-5057, FAX DSN 879-4347, or e-mail to brad.friedman@disa.mil.  The JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ  85670-2798.  The tracking number for the SUT is 0815802.

FOR THE COMMANDER:

2  Enclosures a/s                                        for RICHARD A. MEADOR
                                                             Chief
                                                             Battlespace Communications Portfolio

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    Division, J68
Defense Information Systems Agency, GS23

# ADDITIONAL REFERENCES

(c)    Defense Information Systems Agency, "Department of Defense Networks Unified Capabilities Requirements," 21 December 2007

(d)    Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP), Change 2," 2 October 2006

(e)    Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Polycom HDX 9000 Series, HDX 8000 Series, HDX 7000 Series, and HDX 4000 Series with Software Release 2.0.5_J," 10 March 2009

# CERTIFICATION TESTING SUMMARY

**1.  SYSTEM TITLE.**  The Polycom HDX 9000 Series, HDX 8000 Series, HDX 7000 Series, and HDX 4000 Series with Software Release 2.0.5_J, hereinafter referred to as the System Under Test (SUT).

**2.  PROPONENT.**  Department of Defense (DoD), US Army, Headquarters, United States Army Information Systems Engineering Command, (HQ USAISEC).

**3.  PROGRAM MANAGER.**  Mr. Gary Kitsmiller, HQ USAISEC, Bldg 53301, Ft. Huachuca, AZ  85613-5300, Email: gary.kitsmiller@us.army.mil

**4.  TESTER.**  Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.

**5.  SYSTEM UNDER TEST DESCRIPTION**.  The SUT is a family of high-performance video systems.  These Video Teleconferencing (VTC) systems set on the top of a monitor and are designed for medium and large-sized videoconferencing sessions.  The SUT offers 1280 x 720 (720p) resolution with over nine times the video quality of Common Intermediate Format video.

The SUT supports the following features which were met through testing or vendor submission of Letters of Compliance (LoC) unless otherwise noted:

- Supports Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) and Primary Rate Interface (PRI), Digital Transmission Link Level 1 (T1), or European Basic Multiplex Rate (E1) International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) H.320
- Network Interfaces:  ISDN Quad BRI, ISDN PRI T1 or E1, 10/100/1000 auto Network Interface Card (NIC)
- Serial support:  ITU-T V.35, Electronic Industries Alliance (EIA)-530, and EIA-449 with EIA-366 dialing
- Supported Standards:  ITU-T H.320 up to 2 Megabits per second (Mbps)
- Supports ITU-T H.323 up to 4 Mbps point-to-point, Session Initiation Protocol (SIP) up to 4 Mbps (not tested and not certified)
- Audio standards:  ITU-T G.711, ITU-T G.722, ITU-T G.722.1, ITU-T G.728, MPEG4 AAC-LD
- Video standards:  ITU-T H.261, ITU-T H.263, ITU-T H.263++, ITU-T H.264, ITU-T H.239, ITU-T H.241
- Multi-Control Point compatibility ITU-T H.243, ITU-T H.231, ITU-T H.221, ITU-T H.224/H.281
- Inverse Multiplexing ITU-T H.244
- Up to three monitors, wireless remote control, camera, microphone
- Microphones provide a 360 degree range, mute button, and up to two microphones in a daisy-chain configuration
- Echo Cancellation, Adaptive Post Filtering, Automatic Gain Control, Automatic Noise Suppression

- Video formats supported:  National Television Standards Committee, Phase Alternate Line, Video Graphics Array, Super Video Graphics Array, Extended Graphics Array

**6.  OPERATIONAL ARCHITECTURE.**  The Unified Capabilities Requirements (UCR) Defense Switched Network (DSN) architecture in Figure 2-1 depicts the relationship of the SUT to the DSN switches.
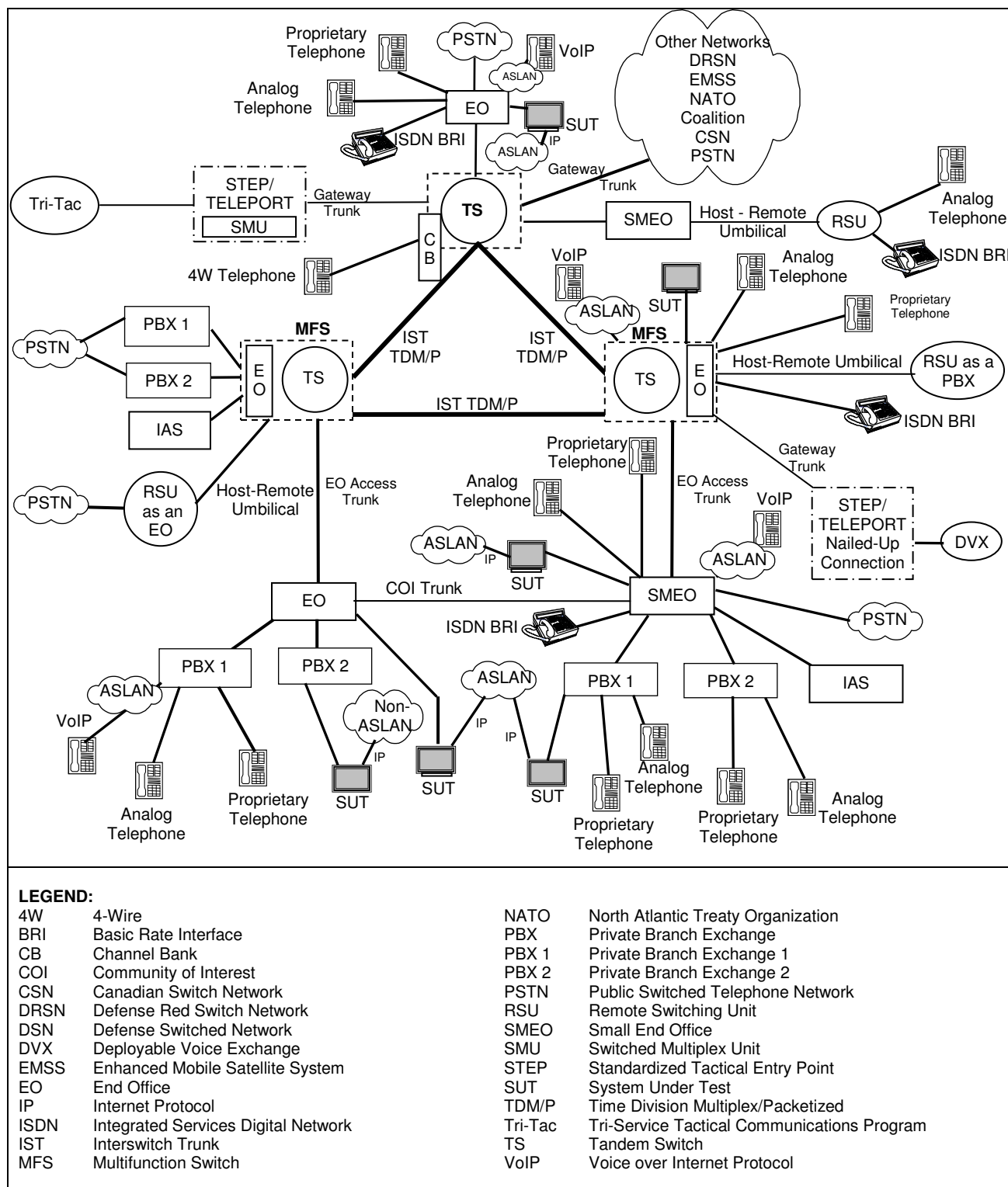
**Figure 2-1.  DSN Architecture**

**LEGEND:**

| | | | |
|---|---|---|---|
| 4W | 4-Wire | NATO | North Atlantic Treaty Organization |
| BRI | Basic Rate Interface | PBX | Private Branch Exchange |
| CB | Channel Bank | PBX 1 | Private Branch Exchange 1 |
| COI | Community of Interest | PBX 2 | Private Branch Exchange 2 |
| CSN | Canadian Switch Network | PSTN | Public Switched Telephone Network |
| DRSN | Defense Red Switch Network | RSU | Remote Switching Unit |
| DSN | Defense Switched Network | SMEO | Small End Office |
| DVX | Deployable Voice Exchange | SMU | Switched Multiplex Unit |
| EMSS | Enhanced Mobile Satellite System | STEP | Standardized Tactical Entry Point |
| EO | End Office | SUT | System Under Test |
| IP | Internet Protocol | TDM/P | Time Division Multiplex/Packetized |
| ISDN | Integrated Services Digital Network | Tri-Tac | Tri-Service Tactical Communications Program |
| IST | Interswitch Trunk | TS | Tandem Switch |
| MFS | Multifunction Switch | VoIP | Voice over Internet Protocol |

**7. REQUIRED SYSTEM INTERFACES.** Requirements specific to the SUT and interoperability results are listed in Table 2-1. These requirements are derived from the UCR, appendix 8, Interface and Functional Requirements and verified through JITC testing and review of vendor's LoC.

**Table 2-1. SUT Functional Requirements and Interoperability Status**

| Interface | Critical | Certified | Requirements Required or Conditional | Status | UCR Reference |
|---|---|---|---|---|---|
| ITU-T H.323 | No [1] | Yes [2] | The VTC system/endpoints shall meet the requirements of FTR1080B-2002 (R) | Met | A8.5 |
| | | | ITU-T H.323 in accordance with FTR 1080B-2002 (C) | Met | A8.5 |
| | | | Layer 3 Differential Service Code Point tagging as specified in UCR paragraph A.3.2.9.2 (C) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics shall not degrade or impair switch and associated network operations (R) | Met | A8.5 |
| ISDN BRI | No [1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Integrated BRI interface shall be in conformance with Terminal Adaptor requirements in UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations. (R) | Met | A8.5 |
| ISDN PRI T1 ISDN PRI E1 | No [1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Integrated PRI interface shall be in conformance with IAS requirements in UCR, Appendix 6 (IAS) (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations.(R) | Met | A8.5 |
| Serial Interfaces [3]: EIA-366A EIA-449 EIA-530 ITU-T V.35 [4] | No [1] | Yes | The VTC system/endpoints shall meet the requirements of FTR 1080B-2002 (R) | Met | A8.5 |
| | | | A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference (R) | Met | A8.5 |
| | | | Audio add-on interface, implemented independently of an IAS, shall be in accordance with UCR, Appendix 7 (CPE) (C) | Met | A8.5 |
| | | | Connections shall be in conformance with the requirements for serial interface(s) as described in FTR 1080B-2002 (C) | Met | A8.5 |
| | | | Physical, electrical, and software characteristics of VTU system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations.(R) | Met | A8.5 |

**Table 2-1.  SUT Functional Requirements and Interoperability Status (continued)**

| Interface | Critical | Certified | Requirements Required or Conditional | Status | UCR Reference |
|---|---|---|---|---|---|
| | Yes | Certified | Security (R) | See note 5. | A8.7 |

**NOTES:**
1    The VTC system interface requirements can be met with an ISDN BRI, ISDN PRI, Serial, or ITU-T H.323 interface.
2    The SUT also met the requirements for the ITU-T H.323 interface standard; however, Assured Service is not yet defined for the ITU-T H.323 interface.  Since ITU-T H.323 interfaces do not provide Assured Services during a crisis or contingency, users' access to the DSN will be on a best effort basis.  Therefore, C2 VTC users and Special C2 VTC users are not authorized to be served by an ITU-T H.323 interface.
3    The SUT meets the critical interoperability requirements for serial interfaces; however, the serial interfaces must connect to an IAS or TA which provides an inverse multiplex capability and a direct interface to the DSN.  The SUT is certified with any IAS or TA on the DSN Approved Products List.
4    The electrical physical interface tested was ITU-T V.35 in accordance with ITU-T V.36/V.37.
5    Security is tested by DISA-led Information Assurance test teams and published in a separate report, reference (e).


**LEGEND:**

| | | | |
|---|---|---|---|
| A | UCR Appendix | ISDN | Integrated Services Digital Network |
| BRI | Basic Rate Interface | ITU-T | International Telecommunication Union - |
| C | Conditional | | Telecommunication Standardization Sector |
| C2 | Command and Control | JITC | Joint Interoperability Test Command |
| CPE | Customer Premise Equipment | kbps | kilobits per second |
| DISA | Defense Information Systems Agency | kHz | kiloHertz |
| DSN | Defense Switched Network | Mbps | Megabits per seconds |
| E1 | European Basic Multiplex Rate (2.048 Mbps) | PMO | Program Management Office |
| EIA | Electronic Industries Alliance | PRI | Primary Rate Interface |
| EIA-366A | Standard for interface between data terminal equipment and automatic calling equipment for data communication | R | Required |
| | | SUT | System Under Test |
| | | T1 | Digital Transmission Link Level 1 (1.544 Mbps) |
| EIA-449 | Standard for 37-position and 9-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange | TA | Terminal Adapter |
| | | UCR | Unified Capabilities Requirements |
| | | V.35 | Standard for data transmission at 48 kbps using 60-108 kHz group band circuits |
| EIA-530 | Standard for 25-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange | V.36 | Modems for synchronous data transmission using 60-108 kHz group band circuits |
| | | V.37 | Synchronous data transmission at a data signaling rate higher than 72 kbps using 60-108 kHz group band circuits |
| FTR | Federal Telecommunications Recommendation | | |
| H.320 | Standard for narrowband VTC | | |
| H.323 | Standard for multi-media communications on packet-based networks | VTC | Video Teleconferencing |
| | | VTU | Video Teleconferencing Unit |
| IAS | Integrated Access Switch | | |

**8.  TEST NETWORK DESCRIPTION.**  The SUT was tested at JITC's Global Information Grid Network Test Facility (GNTF) in a manner and configuration similar to that of the DSN operational environment.  Testing the system's required functions and features was conducted using the test configurations depicted in Figures 2-2 through 2-4.  Figure 2-2 depicts the SUT ISDN (PRI and BRI) and ITU-T  H.323 Internet Protocol (IP) test configuration.  Figure 2-3 depicts the SUT serial with encryption test configuration.  Figure 2-4 depicts the ITU-T V.35 serial test configuration.
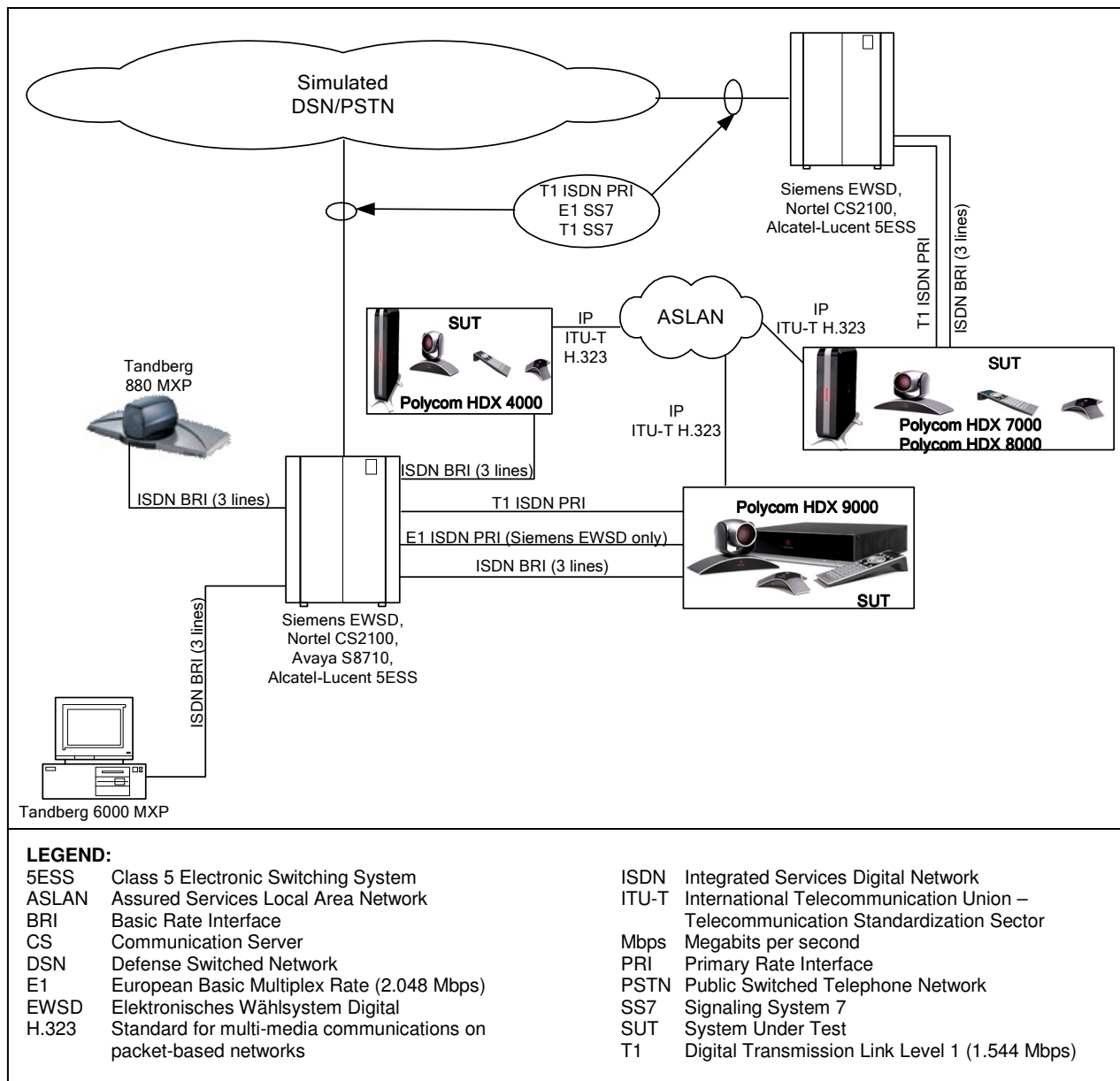
**Figure 2-2. SUT ISDN (PRI & BRI) and ITU-T H.323 IP Test Configuration**
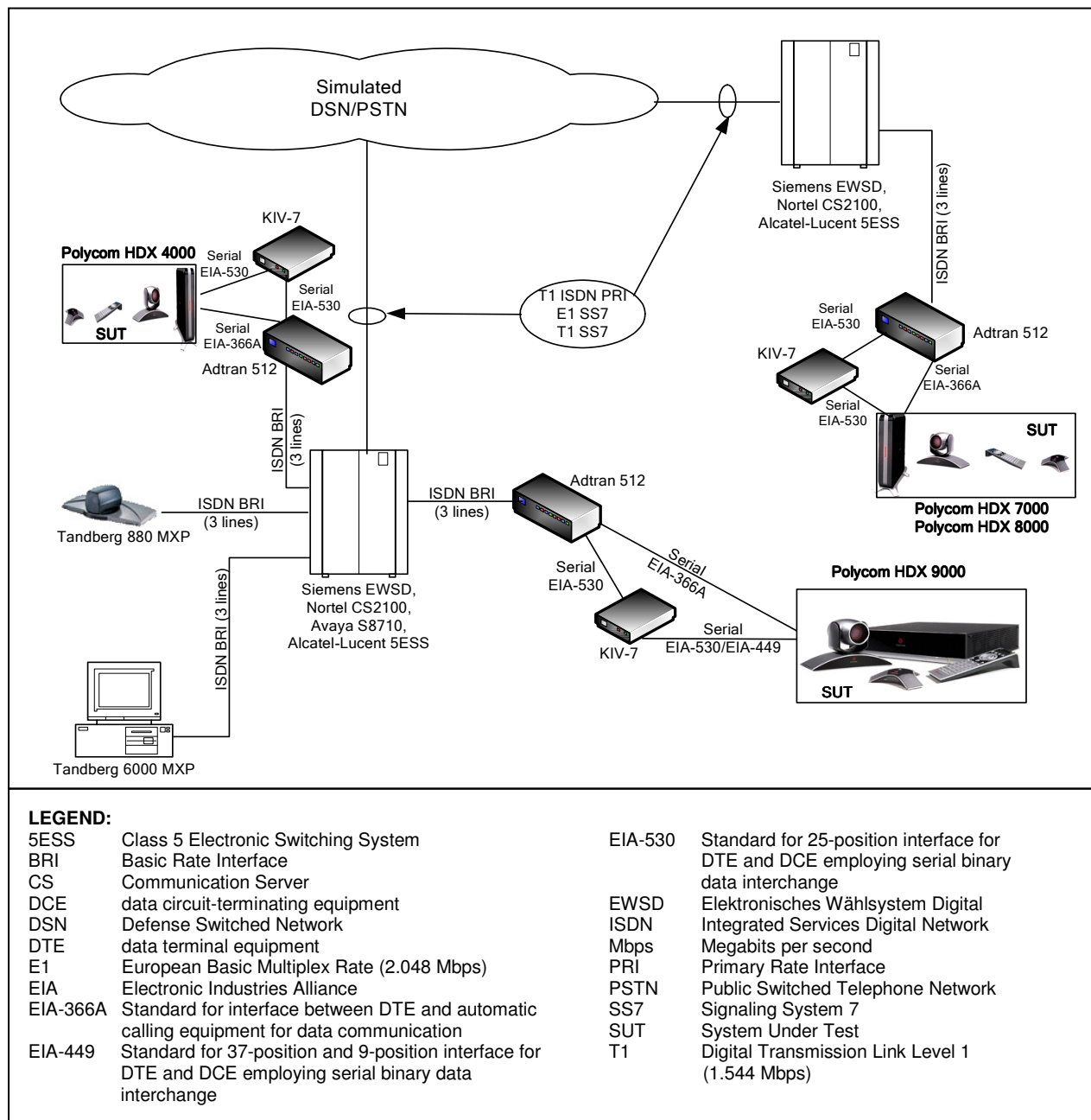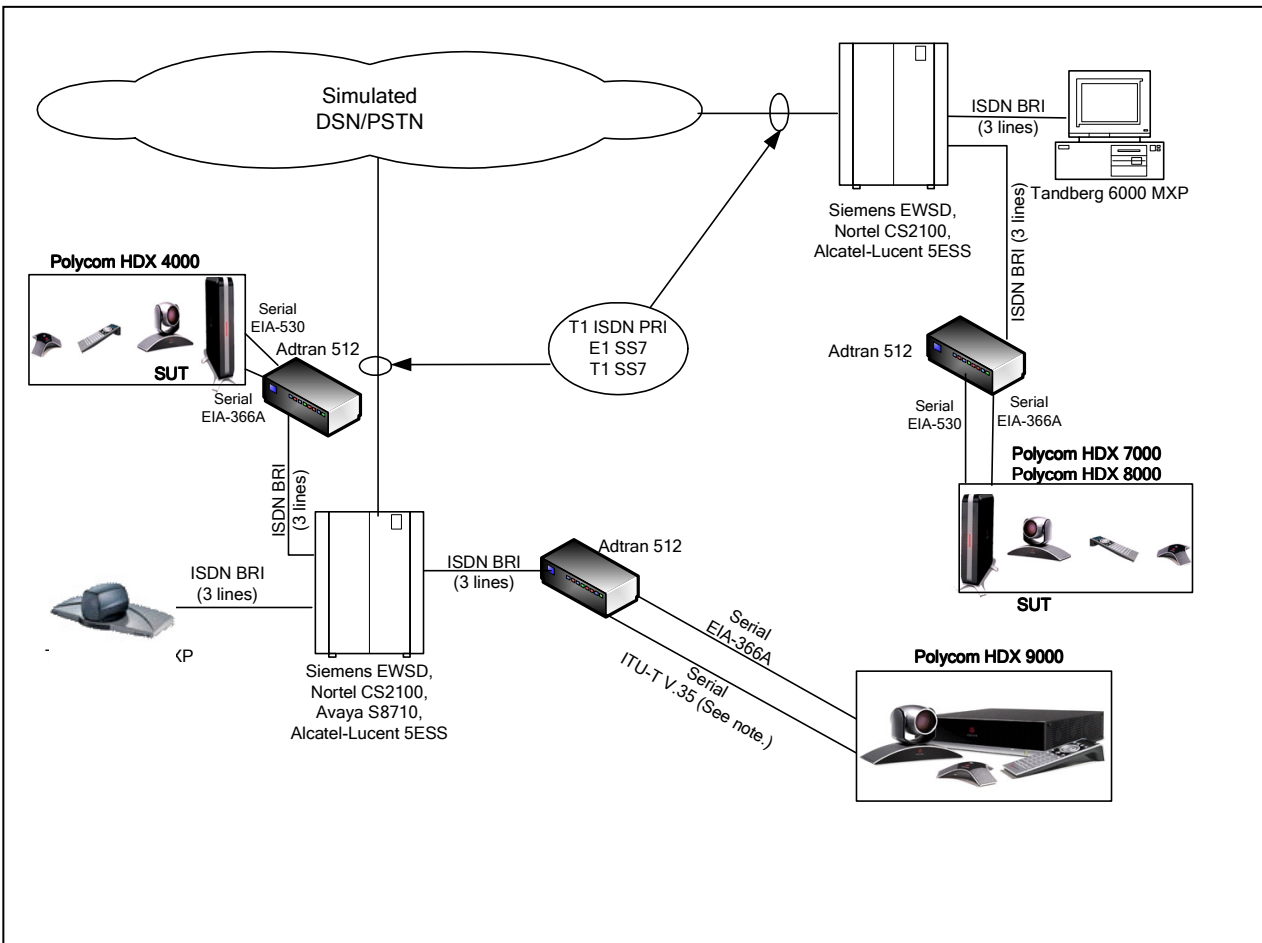
**LEGEND:**

| | | | |
|---|---|---|---|
| 5ESS | Class 5 Electronic Switching System | ISDN | Integrated Services Digital Network |
| ASLAN | Assured Services Local Area Network | ITU-T | International Telecommunication Union – |
| BRI | Basic Rate Interface | | Telecommunication Standardization Sector |
| CS | Communication Server | Mbps | Megabits per second |
| DSN | Defense Switched Network | PRI | Primary Rate Interface |
| E1 | European Basic Multiplex Rate (2.048 Mbps) | PSTN | Public Switched Telephone Network |
| EWSD | Elektronisches Wählsystem Digital | SS7 | Signaling System 7 |
| H.323 | Standard for multi-media communications on | SUT | System Under Test |
| | packet-based networks | T1 | Digital Transmission Link Level 1 (1.544 Mbps) |

**Figure 2-3. SUT Serial with Encryption Test Configuration**

**LEGEND:**

| | |
|---|---|
| 5ESS | Class 5 Electronic Switching System |
| BRI | Basic Rate Interface |
| CS | Communication Server |
| DCE | data circuit-terminating equipment |
| DSN | Defense Switched Network |
| DTE | data terminal equipment |
| E1 | European Basic Multiplex Rate (2.048 Mbps) |
| EIA | Electronic Industries Alliance |
| EIA-366A | Standard for interface between DTE and automatic calling equipment for data communication |
| EIA-449 | Standard for 37-position and 9-position interface for DTE and DCE employing serial binary data interchange |

| | |
|---|---|
| EIA-530 | Standard for 25-position interface for DTE and DCE employing serial binary data interchange |
| EWSD | Elektronisches Wählsystem Digital |
| ISDN | Integrated Services Digital Network |
| Mbps | Megabits per second |
| PRI | Primary Rate Interface |
| PSTN | Public Switched Telephone Network |
| SS7 | Signaling System 7 |
| SUT | System Under Test |
| T1 | Digital Transmission Link Level 1 (1.544 Mbps) |

**NOTE:** The electrical physical interface tested was ITU-T V.35 in accordance with ITU-T V.36/V.37.

**LEGEND:**

| | | | |
|---|---|---|---|
| 5ESS | Class 5 Electronic Switching System | ITU-T | International Telecommunication Union - |
| BRI | Basic Rate Interface | | Telecommunication Standardization Sector |
| CS | Communication Server | kbps | kilobits per second |
| DCE | data circuit-terminating equipment | kHz | kiloHertz |
| DSN | Defense Switched Network | Mbps | Megabits per second |
| DTE | data terminal equipment | MXP | Media XPerience |
| E1 | European Basic Multiplex Rate (2.048 Mbps) | PRI | Primary Rate Interface |
| | | PSTN | Public Switched Telephone Network |
| EIA | Electronic Industries Alliance | SS7 | Signaling System 7 |
| EIA-366A | Standard for interface between DTE and automatic calling equipment for data communication | SUT | System Under Test |
| | | T1 | Digital Transmission Link Level 1 (1.544 Mbps) |
| | | V.35 | Standard for data transmission at 48 kbps using 60-108 kHz group band circuits |
| EIA-530 | Standard for 25-position interface for DTE and DCE employing serial binary data interchange | V.36 | Modems for synchronous data transmission using 60-108 kHz group band circuits |
| EWSD | Elektronisches Wählsystem Digital | V.37 | Synchronous data transmission at a data signaling rate higher than 72 kbps using 60-108 kHz group band circuits |
| ISDN | Integrated Services Digital Network | | |

**Figure 2-4.  SUT ITU-T V.35 Serial Test Configuration**

**9. SYSTEM CONFIGURATIONS.** Table 2-2 provides the system configurations, hardware, and software components tested with the SUT. The SUT was tested in an operationally realistic environment to determine interoperability with a complement of DSN switches noted in Table 2-2. Table 2-2 lists the DSN switches which depict the tested configuration and is not intended to identify the only switches that are certified with the SUT. The SUT is certified with switching systems listed on the Unified Capabilities (UC) Approved Products List (APL) that offer the same certified interfaces.

**Table 2-2.  Tested System Configurations**

| System Name | | Software Release |
|---|---|---|
| Siemens EWSD | | 19d with Patch Set 46 |
| Nortel CS2100 | | Succession Enterprise (SE)09.1 |
| Avaya S8710 | | Communication Manager (CM) 4.0 (R014x.00.2.731.7: Super Patch 14419) |
| Alcatel-Lucent 5ESS | | 5E16.2, Broadcast Warning Message (BWM) 07-0003 |
| Adtran 512 IMUX | | Firmware Version CS.0, Cksum10b2 |
| Adtran 512 IMUX | | Firmware Version F.00, Cksum2d44 |
| Tandberg 6000 MXP | | F7.1.1 NTSC |
| Tandberg 880 MXP | | F2.3 NTSC |
| **SUT** <br> **(See note.)** | **Polycom HDX 4000** <br> Polycom HDX 4001 <br> Polycom HDX 4002 <br> **Polycom HDX 7000** <br> Polycom HDX 7001 <br> Polycom HDX 7002 <br> **Polycom HDX 8000** <br> Polycom HDX 8002 <br> Polycom HDX 8004 <br> **Polycom HDX 9004** <br> Polycom HDX 9001 <br> Polycom HDX 9002 | 2.0.5_J |

**NOTE:** Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.

**LEGEND:**
| | | | |
|---|---|---|---|
| 5ESS | Class 5 Electronic Switching System | JITC | Joint Interoperability Test Command |
| CS | Communication Server | NTSC | National Television Standards Committee |
| EWSD | Elektronisches Wählsystem Digital | SUT | System Under Test |
| IMUX | Inverse Multiplexer | | |

**10. TEST LIMITATIONS.** None.

**11. TEST RESULTS**

**a. Discussion.** The VTC system interface requirements can be met with an ISDN BRI, ISDN PRI, Serial, or ITU-T H.323 interface. Although each interface is conditional, if the SUT offers an interface, it must meet the critical requirements for that interface. The SUT minimum critical interoperability interface and functional requirements were met through both interoperability certification testing conducted at the JITC GNTF and review of the vendor's LoC. Bonding mode 1 was tested to requirements defined in UCR, paragraph A8.5 and Federal Telecommunications Recommendation 1080B-2002. Bonding, often referred to as channel aggregation, takes place through inverse multiplexing. Inverse multiplexing takes a high-bandwidth

signal and splits it for transport through the network over multiple lower-bandwidth channels.  At the receiving end, the multiple, lower-bandwidth signals are recombined into the original high-bandwidth signal.  A passed test result was based on 100 percent of the calls receiving a score of four or better on the subjective quality scale as defined in Table 2-3.

**Table 2-3.  Video and Voice Subjective Quality Scale**

| Rating | Reference | Definition |
|:------:|:---------:|:-----------|
| 1 | *Unusable* | Quality is unusable.  Voice and video may be heard and seen but is unrecognizable. |
| 2 | *Poor* | Quality is unusable.  Words and phrases are not fully understandable or video cannot be properly identified. |
| 3 | *Fair* | Quality is seriously affected by distortion.  Repeating words and phrases are required to convey speech or video is seriously impacted and barely recognizable. |
| **4** | ***Good*** | **Quality is usable.  Audio or video is not impaired but some distortion is noticeable** |
| 5 | *Excellent* | Quality is unaffected.  No discernable problems with either audio or video. |
| **NOTE:** Audio and video quality during a conference will receive a subjective rating on the Data Collection Form.  A rating of lower than 4 on this reference scale is considered a failure. ||| 

**b.  Test Conduct.**  Multiple two-way 112 to 384-kilobits per second (kbps) bonding mode 1 Multipoint and Point-to-Point test calls at different durations (15-minute, 30-minute, 1-hour, 24-hours, and 48-hours) were placed over the test network shown in Figure 2-2 via all the combinations depicted in Table 2-1.  The Multipoint and Point-to-Point bonding mode 1 VTC test calls were placed at various precedence levels over the test configurations depicted in Figures 2-2 through 2-4.

Seven- and ten-digit calls were placed to verify that the SUT met the capability to support both the North American Numbering Plan and the DSN World Wide Numbering and Dialing Plan (WWNDP) defined in UCR, paragraph A8.5.  Multilevel precedence video calls were placed from the SUT and established within the DSN at the respective precedence level dialing the DSN WWNDP access code.  The SUT was also tested with secure video sessions using a KIV-7 Communications Security (COMSEC) device as shown in Figure 2-3.  Table 2-4 provides the KIV-7 COMSEC device configuration settings.

# Table 2-4. COMSEC Configuration

| | KIV-7 HSB Serial Number | KIV-7 HSB SETUP Storage Location | Channel ID/Description | Date |
|---|---|---|---|---|
| | | [x] STO 1   [ ] STO2   [ ] STO3 | OC-256   KIV-7 HSB Setup | 12-16-04 |

| Setup ABCD | Setup Item | Options   (Check the box to the left of the selected option. The highlighted box [x] indicates the setting during test) |
|---|---|---|
| [-SETUP A] | [=ClkSel] | [ ]MASTER   **[X]SLAVE**   [ ]STA CLK   [ ]TT SEL1   [ ]TT SEL2 |
| | [=SyncSel] | **[X ] RED** [ ] RED-as   [ ] NR   [ ] NR-as [ ] OP2 [ ] ACT1   [ ] ACT2   [ ] HF   [ ] HF-as [ ] EXT   [ ]EXT-as |
| | [=CommSel] | **[X] FDX**  [ ] FDX Ind   [ ] TX only   [ ] RX only   [ ]SPLX 2W   [ ] SPLX 4W |
| | [=DataMod] | [ ] BB cond   **[X] BB**  [ ] DP   [ ] DP cond |
| | [=DataLen] | **[X] Synch/S**   [ ] Synch/A   [ ] 7 bits [ ] 8 bits [ ] 10 bits [ ] 11 bits |
| | [=TX Rate] | [ ] 50   [ ] 75   [ ] 100   [ ] 110   [ ] 150   [ ] 200   [ ] 220   [ ] 300   [ ] 600   [ ] 1.2k   [ ] 2.4k<br>[ ] 4.8k   [ ] 8.0k   [ ] 9.6k   [ ] 14.4k [ ] 16k   [ ] 19.2k [ ] 28.8k [ ] 32k   [ ] 38.4k [ ] 57.6k [ ] 64k<br>[ ] 115.2k [ ] 128k   [ ] 192k   [ ] 288k   [ ] EXT 32x   **[X] EXT DRC** |
| | [=RX Rate] | [ ] 50   [ ] 75   [ ] 100   [ ] 110   [ ] 150   [ ] 200   [ ] 220   [ ] 300   [ ] 600   [ ] 1.2k   [ ] 2.4k<br>[ ] 4.8k   [ ] 8.0k   [ ] 9.6k   [ ] 14.4k [ ] 16k   [ ] 19.2k [ ] 28.8k [ ] 32k   [ ] 38.4k [ ] 57.6k [ ] 64k<br>[ ] 115.2k [ ] 128k   [ ] 192k   [ ] 288k   [ ] EXT 32x   **[X] EXT DRC** |
| | [=TTY Mode] | **[X] Auto** [ ] Manual [ ] Unframd   [ ] SPLXint   [ ] SPLXext |
| | [=I/Fctrl] | [ ] OFF   **[X] PTRS**   [ ] RS&CS   **[X]CTCS** [..] PTTR   [..] CTRR   [..] CTDM   **[X] Resync Level** |
| [-SETUP B] | [=Invert] | [ ] BLKdata   [ ] REDdata   [ ] SyncTX [ ] SyncRX   [x] NONE   **Notes:** |
| | [=TXClock] | **[X] contTXC**   [ ] gateTXC |
| | [=RXClock] | **[X] contRXC**   [ ] gateRC |
| | [=SyncOOS] | [ ] Enabled   **[X] Disabled** |
| | [=IdleSel] | [ ] Enabled   **[X] Disabled** |
| | [=AutoPhs] | **[X] OFF**   [ ] ON 2s [ ] ON 5s [ ] ON 10s   [ ] ON 15s |
| | [=UpdateU] | **[X] Enabled**   [ ] Disabled   [ ] Clock Lock |
| [-SETUP C] | [=RED I/F] | [ ] RS-232   **[X] EIA-530**   [ ] 422/423 |
| | [=BLK I/F] | [ ] RS-232   **[X] EIA-530**   [ ] 422/423 |
| | [=FIL I/F] | **[X] 102/Std**   [ ] 102/Tag   [ ] 101/Std   [ ] 101/Tag |
| | [=FILaddr] | **254**   Record selected address 1 – 254. Default is 254 |
| | [=RCUaddr] | **31**   Record selected address 1 – 31. Default is 31 |
| | [=Display] | [ ] High   **[X] Medium**   [ ] Low |
| | [=Speaker] | **[X] Enabled**   [ ] Disabled |
| [-SETUP D] | [=Algorithms] | [ ] Master   **[x] Slave**   Algorithm **[x] ALG1** |
| [-SEL KEY] | | **[x] X01**   [ ] X02   [ ] X03   [ ] X04   [ ] X05   [ ] X06   [ ] X07   [ ] X08   [ ] X09   [ ] X10 |

# Table 2-4. COMSEC Configuration (continued)

**LEGEND:**

| | | | |
|---|---|---|---|
| ACT1 | Asynchronous cipher text to 288 kbps | RCUaddr | Remote control address select |
| ACT2 | Asynchronous cipher text to 288 kbps | RED | Redundant (listed under setup A) |
| as | anti-spoof | RED-as | Redundant anti-spoof |
| Auto | Automatic | REDdata | RED (encrypted) (listed under Setup B) |
| Autophs | Autophasing Select | RED I/F | RED (encrypted) interface (listed under Setup C) |
| BB | Baseband | Resync | Resynchronization |
| BB cond | Baseband conditioned | RS&CS | Ready to Send & Clear to Send |
| BLK | Invert Black | RS-232 | Recommended standard 232 |
| BLKdata | Invert black data | RX | Receive |
| ClkSel | Clock Select | RXClock | Receive Clock |
| CommSel | Communication Select | RX Rate | Receive rate |
| ContRXC | Continuous receive clock | s | Second |
| ContTXC | Continuous transmit clock | SPLX 2W | Simplex 2-Wire |
| CTCS | Cipher text clear to send | SPLX 4W | Simplex 4-Wire |
| CTDM | Cyper Text Data Mode | SPLXext | Simplex external |
| CTRR | Cipher text receiver ready | SPLXint | Simplex internal |
| DataLen | Data Length | STA CLK | Station Clock |
| DataMod | Data Mode | Std | Standard |
| DP | Diphase | STO | Store |
| DP Cond | Conditioned Diphase | Synch/A | 64 characters, asynchronous 10-bit |
| EIA | Electronic Industries Alliance | Synch/S | 512 bits, Synchronous |
| EIA-530 | Standard for 25-position interface for data terminal equipment and automatic calling equipment for data communications | SyncOOS | Synchronization Out of Sync detect signal |
| | | SyncRX | Invert Synchronization receive control signal |
| EXT | External | SyncSel | Synchronization Select |
| EXT DRC | External Data Rate Clock | SyncTX | Invert Synchronization Transmit control signal |
| FDX | Full duplex | TT SEL1 | Terminal Timing Selection 1 |
| FDX Ind | Full duplex independent transmit and receive | TT SEL2 | Terminal Timing Selection 2 |
| FIL | Fill | TTY | Teletype |
| FILaddr | Fill address select | TX | Transmit |
| gateRC | Gated continuous receive clock | TX Clock | Transmit Clock |
| gateTXC | Gated continuous transmit clock | TX Rate | Transmit rate |
| HF | High Frequency | Unframd | Frame transmit, but no receive |
| HSB | High Speed Bravo model | UpdateU | Update Unique variable |
| I/F | Interface | X01 | Cryptographic traffic key position |
| I/Fctrl | Interface control | X02 | Cryptographic traffic key position |
| ID | Identification | X03 | Cryptographic traffic key position |
| IdleSel | Idle Select | X04 | Cryptographic traffic key position |
| kbps | kilobits per second | X05 | Cryptographic traffic key position |
| NR | Non-Redundant | X06 | Cryptographic traffic key position |
| OC | Outpost Communicator | X07 | Cryptographic traffic key position |
| OP2 | Operational Mode 2 | X08 | Cryptographic traffic key position |
| PTRS | Plain text request-to-send | X09 | Cryptographic traffic key position |
| PTTR | Plain text terminal ready | X10 | Cryptographic traffic key position |

The UCR, paragraph A8.5 requirements state:

(1)   The VTC system/endpoints shall meet the requirements of Federal Telecommunications Recommendation (FTR) 1080B-2002.  The SUT met this requirement through testing and the vendor's LoC.

(2)   The VTC features and functions used in conjunction with IP network services shall meet the requirements of ITU-T H.323 in accordance with FTR 1080B-2002.  Additionally, ITU-T H.323 video teleconferencing systems must meet the tagging requirements as specified in UCR, appendix 3, section A3.2.9.2.  The SUT is required to support the 6-bit Differential Service Code Point (DSCP) tagging assignment of 0-63 and it does.  The SUT met the requirements for the ITU-T H.323 interface standard; however, Assured Service is not yet defined for the ITU-T H.323 interface.  Since ITU-T H.323 interfaces do not provide Assured Services during a crisis or contingency, users' access to the DSN via an ITU-T H.323 interface will be on a best effort basis.  Therefore, Command and Control (C2) VTC users and Special C2 VTC users are not authorized to be served by an ITU-T H.323 interface.

(3)   A loss of any conferee on a multipoint videoconference shall not terminate or degrade the DSN service supporting VTC connections of any of the other conferees on the videoconference.  This was tested during each multipoint session established with the SUT by disconnecting single and multiple conferees.  This was done by hanging up and simulating a failure by disconnecting the physical interface.  100 percent of the time during the test, the remaining conferees on the multipoint conference were not affected and remained in the conference.

(4)   An audio add-on interface, implemented independently of an Integrated Access Switch (IAS), shall be in accordance with the UCR, appendix 7.  The SUT met this requirement through testing and the vendor's LoC.

(5)   A VTC system/endpoint that uses an integrated BRI interface to connect to the DSN shall be in conformance with the requirements associated with a Terminal Adaptor (TA) as described in the UCR, appendix 7.  The SUT met this requirement through testing and the vendor's LoC.

(6)   A VTC system/endpoint that uses an integrated PRI interface to connect to the DSN shall be in conformance with the requirements associated with an IAS as described in the UCR, appendix 6.  The SUT met this requirement through testing and the vendor's LoC.

(7)   A VTC system/endpoint that uses a serial interface(s) to another device, such as a cryptographic device, IAS, or TA, for eventual connection to the DSN, shall be in conformance with the requirements for that serial interface(s) as described in FTR 1080B-2002.  The SUT met this requirement through testing and the vendor's LoC.

(8)  The physical, electrical, and software characteristics of Video Teleconferencing Unit system(s)/ endpoint(s) that are used in the DSN network shall not degrade or impair the serving DSN switch and its associated network operations.  This was tested by conducting other tests on the serving DSN switch to include bulk call loading while point-to-point and multipoint video sessions were established.  100 percent of the time during the test, the SUT physical, electrical, and software characteristics did not impair the serving DSN switch and its associated operations.

c.  **Test Summary.**  The SUT met the critical interface and functional requirements for a VTC system for the interfaces depicted in Table 2-1, as set forth in Appendix 8 of reference (c), and is certified for joint use within the DSN.  The SUT also met the requirements for the ITU-T H.323 interface standard; however, Assured Service is not yet defined for the ITU-T H.323 interface.  Since ITU-T H.323 interfaces do not provide Assured Services during a crisis or contingency, users' access to the DSN will be on a best effort basis.  Therefore, C2 VTC users and Special C2 VTC users are not authorized to be served by an ITU-T H.323 interface.  The SUT meets the critical interoperability requirements for serial interfaces; however, the serial interfaces must connect to an IAS or TA, which provides an inverse multiplex capability and a direct interface to the DSN.  The SUT is certified with any IAS or TA on the UC APL.

**12.  TEST AND ANALYSIS REPORT.**  No detailed test report was developed in accordance with the Program Manager's request.  JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) System, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail.  More comprehensive interoperability status information is available via the JITC System Tracking Program (STP).  The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil.  Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at ttp://jit.fhu.disa.mil (NIPRNet), or http://199.208.204.125 (SIPRNet).  Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi.